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Population Change and Economic Development: The Great Debate Revisited

David Bloom and Pia Malaney

Perhaps the most central question faced by economists today is: "Why are some countries so much richer than others?" Data from the early 1800s show that the per capita GDP of the world's richest countries exceeded that of the world's poorest countries by approximately a factor of two. Today, the (purchasing power parity adjusted) per capita income of the world's richest country is approximately fifty times that of the poorest country. Explaining this discrepancy in per capita GDP and in economic growth remains the biggest challenge for development economics.

The modern tradition in economics involves two standard approaches for explaining income differentials: neoclassical growth models and endogenous growth models. In neoclassical growth models income growth is driven by capital accumulation. Investments in capital increase the productivity of labor and income rises. The rate of capital accumulation is determined either by an exogenously fixed rate of savings (as in the Solow-Swan model) or endogenously through intertemporal utility maximization (as in the Ramsey model). Demography enters the model only inasmuch as rapid population growth reduces the amount of capital available for each worker, lowering productivity. In these models all inputs are assumed to be reproducible and there is no fixed factor, such as land, which would lead to lower output per capita at higher levels of population. It is therefore not the absolute size of the population but rather its growth rate that is relevant to economic growth.

A fundamental assumption of the neoclassical model is that there are diminishing returns to capital. The implication of this assumption is that while rich countries may have higher levels of capital per worker this has only a small impact on income levels and so predicts relatively small differences in income levels for countries with different savings rates. It is therefore difficult for the model to generate the vast differences in real income levels we observe in the world.

Endogenous growth theory is a response to this problem. If the elasticity of output with respect to capital is one, so that a 1% increase in capital stock leads to a 1% increase in output, capital accumulation becomes a very powerful force in the growth process. With no diminishing returns to capital economies need not slow down as they get richer and growth can continue indefinitely. The theoretical challenge for endogenous growth models has been to explain why returns to capital should not decline. For example, Grossman and Helpman (1991) and Romer (1993), argue that technology is endogenous and depends on investment in research and development and that such investment may have very high social returns.

Figure 1 shows a stylized framework within which to view these models. Both the neoclassical and the endogenous approaches focus primarily on the arrows linking capital to income. Increases in capital lead to higher income, which in turn leads to greater increases in capital. The diminishing marginal returns to capital in the neoclassical model, however, imply that this feedback loop eventually tapers off, and small differences in capital cannot explain large income differentials. Endogenous growth models allow for a much stronger feedback effect, implying that the effect of a capital differential is more significant. However the claims made by endogenous growth theory, that the magnitude of these arrows are large enough to explain observed differences, has been a subject of much debate.

While the historical literature on the role of demography in the growth process dates back many decades, its role in the current debate has been peripheral. Current work on the impact of demographic changes on economic growth, however, shows that demography might in fact play a significant role (Bloom and Williamson, 1998). Integrating fertility and mortality with capital accumulation in a process of economic growth has the potential to explain very large differences in observed outcomes, as the feedback effects that occur between each of the factors can multiply the effect of an exogenous change in any one factor.

Figure 2 shows the three-way linkages between demography, human and physical capital, and income. The arrow that links income to demography is perhaps the best documented relationship within the system. Increased income lowers mortality rates as the consumption of health care increases. It also lowers fertility rates as wages increase and the opportunity cost of raising children increases, especially for women. The arrow in the reverse direction, linking demography to income, has more complex effects. While the negative linkages between population growth and economic growth are incorporated in the neoclassical model, Bloom and Williamson (1998) show that a demographic transition can have strong positive, if temporary impacts on economic growth. This mechanism will be discussed further in a later section.

Demography is also linked to the accumulation of both physical capital and human capital (i.e. health and education). Evidence from developing countries has shown that lower fertility has a direct effect on human capital, as smaller families are more likely to educate their children. Health and nutrition status is also higher, as large families tend to be poorer and hence less able to fulfill basic needs. More recently, economists have pointed to the indirect effects of a changing demography: as life expectancy increases, individuals are expected to save more for their old age, thereby increasing the accumulation of physical capital in the economy (Mason (1997), Bloom and Canning (1999)). Furthermore, as couples have fewer children to care for them in their old age, they will invest, instead, in assets that can provide financial returns, thereby accelerating capital accumulation. The reverse arrows, that link capital to demography, have been focused on particularly in the case of education. As educational attainment increases, especially for women, it has been found to decrease infant mortality rates, as more educated mothers can better care for their children. It also increases the opportunity cost of children, thereby reducing fertility rates.

Once these linkages are incorporated into the system it is easier to explain the wide discrepancies in income that are observed, as an exogenous change in any one of the factors will affect each of the other factors and will get multiplied as it works through the system. For example, the introduction of a family planning program may bring down fertility rates. This may increase income, which could, in turn, increase education levels perhaps further lowering fertility rates. The linkages can thereby set in place a virtuous spiral of economic development. Of course, the reverse may also be true. Economies may be trapped in a downward spiral of low growth and high fertility and mortality if endogenous growth only occurs after a critical level of income has been achieved.

Thus viewing demography as part of the larger economic system enables us to explain why some countries have been so much more successful than others at generating economic growth. The next section will discuss the historical context of the population debate. Section III will then describe the demographic transition and its relationship with income growth and capital accumulation. Section IV will explore the policy implications of this research.

The Population Debate

Between 1950 and 1995, the world's population grew from 2.5 billion to 5.7 billion people, and is expected to grow by another 4 billion people over the next 50 years. There has been a long-standing debate on the effects that such population growth can have on economic development and growth of countries. This debate is generally couched in the distinctions made by 'population optimists' and by 'population pessimists'. Population optimists believe that increases in population increase the incentives for the invention of new technologies and the diffusion of existing ones [Boserup 1981]. They also point out that larger populations allow for economies of scale both in production and in consumption [Kuznets 1966, Simon 1977]. Population pessimists, on the other hand, believe that the burden placed on the resources of an economy by an increasing population is a hindrance to economic development. The original 'Malthusian' perspective focused on agricultural resource constraints, while later economic models were based on the capital to labor ratio: increases in population meant that there would be less capital per person, thereby reducing the productivity of labor, such as in the neoclassical model discussed above.

Empirical studies, which have used cross-country data to try and evaluate these claims, have, however, found little evidence to support either argument. Once the effects of initial income, education, and other determinants of growth are taken into account, population growth is found to have a negligible effect on growth of GDP [Bloom and Freeman 1986]. This gave rise to the "population neutralist" or "revisionist" perspective, which held that demography was not a significant factor in the economic growth process. This view was in part responsible for the tenuous position population variables have recently occupied in studies of economic growth.

More recent research, however, has pointed out that it is not sufficient to take into account simply the growth in population when attempting to evaluate the role played by demography, as demographic effects are significantly more complex. Kelley and Schmidt [1995] show that the composition of population growth is an important factor. For example, if population growth occurs mainly through mortality declines that affect infants and children disproportionately (as is well known to be the case in high mortality populations), the effect on age structure will be different than if population growth occurs due to migration, which generally selects for working age people. These changes in age structure can be extremely relevant to the process of economic growth. Bloom and Williamson (1998) further explore the role of a changing age structure, evaluating the impact of demographic transitions on economic growth.

The Demographic Transition

The demographic transition is the shift from high fertility and high mortality rates to low fertility and low mortality rates. It begins in most developing countries with a rapid decline in mortality. Fertility rates do not decline immediately, and the widening discrepancy between mortality and fertility rates leads to a large increase in population growth rates. As fertility rates gradually decline towards replacement levels, population growth will slow down and eventually tend toward stabilization.

Initial declines in mortality are not in general randomly distributed, but are instead concentrated amongst infants and children. The first stage of the demographic transition is therefore characterized by a sharp expansion in the young age cohort relative to other cohorts leading to a high ratio of dependents to working age adults (the dependency ratio). As fertility rates begin to decline this ratio improves, as there are fewer children for each worker to support. When the 'bulge' cohort enters working ages, the dependency burden can be expected to fall even further, as both the youth dependency cohort and the old age dependency cohort will then be relatively small by comparison. Of course as the large cohort ages, dependency ratios will once again rise, as there will then be a high proportion of older dependents per worker.

This transitory phase of low dependency ratios that is faced by countries going through the demographic transition provides a brief window of opportunity to embark upon a path of rapid economic growth. The study by Bloom and Williamson suggests that the demographic transition can explain a significant portion of the 'economic miracle' experienced by several East Asian countries.

Channels of Impact

This section examines two potential channels through which age structure changes that accompany the demographic transition may act on economic growth: labor force growth and changes in the savings rate.

1. Labor Force Growth

The most direct channel by which demography affects growth is through changes in labor input per capita. Working hours per person depend on three factors: the share of the population that is working age, labor force participation rates, and the number of hours per worker. In this section we will separately discuss the relationship between each of these components and economic growth.

The change in the share of the working age population is the pure demographic effect, and during a period of demographic transition can have large effects on a country's growth rate. In the case of East Asia, Bloom and Williamson (1998) attribute 30 to 40 percent of the so-called economic miracle directly to demographic effects. In a simple growth accounting calculation, Young [1994] shows that "a movement from output per capita to output per worker knocks about 1% per annum off of the growth rates of three of the NICs, and about 1.6% per annum off of the growth rate of Singapore," an indication of the extent to which the pure accounting aspect of the demographic transition contributed to economic growth

The effect of the second component, labor force participation rates is somewhat more ambiguous. Child-rearing is time intensive, and a decline in the fertility rate allows women more time to enter the work force, leading to increases in labor force participation rates. However, empirical evidence on this issue is mixed. Bloom and Freeman [1986] point out that participation rates for women increase with declines in fertility in some countries, and decrease in others. They note that this is a factor that is determined not only economically, but also culturally in many developing countries. Another factor that may offset this effect is that decreases in the number of children per family often leads to greater educational investments per child. As years of schooling increase, entrance into the labor force is delayed, thereby having the effect of decreasing labor force participation.

The effect of demography on the number of hours per worker is dependent on the level of development and the nature of the labor market in a particular country. If a country is not capable of efficiently absorbing the increased share of working age population there may be adverse effects on either wages or employment. If, however, the country can achieve sufficiently high rates of economic growth, wages can be expected to rise, and eventually a trade-off between labor/leisure will come into play: while higher wages may induce workers to work more, they will also be wealthier, and being able to afford more leisure, may actually choose to work less.

Demography, therefore, affects all three components of labor input per capita. While the demographic transition will unambiguously raise the share of the working age population, its effects on labor force participation rates and the number of hours per worker are indeterminate.

2. Savings

The theory developed by Coale and Hoover [1958] incorporates the effects of demographic transition on savings and growth. Their theory suggests that as falling mortality rates in high mortality populations disproportionately favors infants and children, the initial rapid increases in population will increase the dependency burden by swelling the numbers of young dependents. The resultant increase in the rate of consumption at the expense of savings has the effect of depressing rates of economic growth, as savings are a key factor of growth. However, as fertility rates start to fall, and the bulge cohort starts entering working ages, the ratio of young dependents to working age population declines and dependency burdens will also start to fall. This will enable savings rates to increase, spurring the process of economic growth. However, this 'gift' will be temporary. As the large cohort ages the elderly burden will once again tilt the dependency ratio and savings rates will fall.

The Coale and Hoover hypothesis also appears to be relevant to government savings. As the share of working age people increases, the percentage of taxpayers increases. The increased tax revenues potentially enable governments to save more, and invest in infrastructure to facilitate the growth process.

While the intuitive appeal of this theory is clear, some of the assumptions have been questioned. Kelley and Schmidt [1996] point out that "the impact of children on household spending can be complex because children may (i) substitute for other forms of consumption; (ii) contribute directly to household market and non-market income; (iii) encourage parents to work more (or less); (iv) stimulate the amassing (or reduction) of estates; and (v) encourage (or discourage) the accumulation of certain types of assets (e.g., education or farm implements)." They claim that the issue of whether increased fertility causes increased or decreased household savings is therefore an empirical one.

While the empirical evidence from micro-economic studies using household survey data in fact do not show large age structure effects on savings [Deaton and Paxson 1997] several studies using macro-economic data find strong evidence to support the Coale and Hoover hypothesis. Higgins and Williamson [1996, 1997] estimate that in 1990-92 East Asia's savings rate was 8.4 percentage points above its 1950-92 average as a result of its reduced dependency burden, while in 1970-74 it was 5.2 percentage points below its 1950-92 average due its heavier dependency burden at that time. Kelley and Schmidt [1996] also state that: "Overall, demographic factors accounted for a major portion of changes in saving across countries and over time."

In order for the potential increase in personal savings to be realized it is important to have efficient credit markets to facilitate savings behavior. Many economists believe that savings are determined by a 'life-cycle' model. It is hypothesized that individuals attempt to smooth the path of consumption over their lifetimes. However, the path of earnings is not smooth. Therefore in the early stages of one's life, one is a net consumer. As one enters the labor force, and earnings and productivity rise, one will become a net saver. Then, after retirement one will once again behave as a net consumer, drawing down savings accumulated during productive years. In the absence of efficient credit markets people will choose to invest in children in order to insure that they are taken care of in their old age. If, however, it is possible for individuals to save and invest in a capital market, it is possible to direct those investments towards capital accumulation, thereby leading to higher labor productivity and a rise in per capita incomes.

Policy Implications

While demographic transitions present developing countries the opportunity for rapid economic growth, the role of policy is central to both the speed of the transition and the ability to take advantage of the opportunity it presents. We now discuss some of the major policy issues that must be undertaken in the face of a changing demography.

1. Population Policy

Population policy is an important determinant of the speed of demographic transition, especially for the second phase, the reduction in fertility rates. Future population growth in Asia can be decomposed into three sources: unwanted fertility, high desired family size, and population momentum. Family planning programs are primarily targeted at bringing down unwanted fertility. There are large numbers of women who may want to limit the size of their families but may not be able to do so because they lack convenient access to affordable contraception. Many countries in Asia have instituted particularly successful family planning programs (e.g., Thailand, Indonesia, Sri Lanka), and these played a central role in their rapid decline in fertility. However, there are still large sections of the population who either cannot access or cannot afford contraception. This is especially true for poor or uneducated women, and women living in rural areas where reproductive health facilities are not easily accessible. Programs that enable women to control their fertility by providing information about methods of fertility control, access to contraception, and, where necessary, subsidies in order to make these services accessible, can have a considerable impact in controlling population growth rates.

Reducing desired fertility is more difficult to target as this involves changing the preferences of individuals. While some national family planning programs attempt to do so through information or propaganda campaigns, wanted fertility appears to be more closely dependent on general socio-economic development. Desired family size is linked to the cost and benefit structure

associated with having children. Raising the status of women, for example by providing them with education or greater employment opportunities, increases the cost of children. Similarly general improvements in health levels which reduce infant mortality bring down fertility rates as couples can better target their family size.

The impact of population policies versus general socio-economic development in controlling fertility rates has been the subject of some debate in recent years, as some have advanced the perspective that it is better for governments and donor agencies to focus policy on raising general standards of living rather than providing family planning services. However, while it is generally accepted that improvements in health, education, and income per capita form the basis of the demand for fertility regulation, effective family planning programs can successfully lower fertility rates even in countries with relatively low per capita incomes. For example Bangladesh has experienced an impressive decline in its total fertility rate despite very low levels of income. This can be explained by the strong emphasis placed on family planning programs by the government and non-governmental organizations that has ensured widespread access to affordable contraception, as well as effective information and counseling services.

Even after fertility rates decline to replacement level, countries will continue to experience population growth, as large birth cohorts enter reproductive ages, an effect known as population momentum. Policy options to control population momentum must rely on finding ways to raise the age of marriage and of first births for women, and to increase spacing between children. Legal approaches have been attempted to raise the age of marriage, with limited success. Once again, improving access to education for girls has proved to be a successful approach.

2. Labor Markets

The potential benefit of the demographic transition can only be realized if the increasing working age population can be absorbed into the labor force. High rates of unemployment or underemployment limit economic growth rates and the benefits of the demographic transition cannot be harnessed.

As a country develops, the share of workers involved in agriculture declines, and the share of industry and services increase. The government plays an important role in this process through the creation and development of labor market institutions. The need for government intervention is important in establishing adequate safety and health conditions in the workplace and regulating such practices as child labor. However, government policies that limit market flexibility, such as setting high minimum wages or placing controls on worker dismissal, can hinder the smooth functioning of the labor market and limit employment creation. This is substantiated by the fact that the fastest growing Asian economies have had few labor market regulations.

3. Education

An educated workforce is an important factor in the transition towards a highly productive economy. Investments in education were a key factor in the growth transition in East Asia. The demographic transition itself has a positive effect in stimulating educational investment: as fertility rates fall, parents generally shift from investing in the quantity of children to investing in the 'quality' in the form of education, and enrolment rates rise. Government investments in education are also likely to be more effective as the expenditure per child increases with a smaller youth cohort. These investments are important, as having an educated and trained labor force contributes to the possibility that demographic transition can be converted into an economic transition.

4. Investment

In order to take advantage of the increases in the labor force, it is important that the economy be able to absorb workers in productive jobs. While a large working age cohort will naturally increase investment demand for housing and capital, government policies that help channel savings into productive investments will better enable the economy to harness the opportunities presented by demographic changes.

5. Pensions

As the bulge cohort starts aging, the elder-dependency burden on the economy begins to rise. Prior to the demographic transition, families with large numbers of children could depend on them for care in their old age. As fertility rates drop, and modernization and industrialization weaken traditional family structures, the need for institutional structures that can fulfil this role is greater, and the creation and development of social security and pension systems become an increasingly important area of public policy.

An effective pension system can not only provide security for the elderly, it can also increase savings, thereby facilitating capital formation. If people are forced to save while they are economically active then these savings can be invested, improving the capital labor ratio and increasing economic growth. This also enables further reductions in fertility rates, as couples no longer have the need to invest in having more children as an insurance for old age.

Conclusions

The demographic transition is initiated by a fall in mortality rates, especially of infants and children. This leads to a very large young age cohort and high dependency burdens, as the population of economically active individuals is comparatively smaller. Gradually, as fertility rates begin to fall, and the large cohort begins to enter working ages, the dependency burden starts to decline, as the new young age cohort is proportionally smaller. This period of low dependency ratios, where working families have fewer children to support, and can therefore consume, save and invest more in both physical and human capital, provides a window of opportunity for the country to embark upon a path of economic growth. As the bulge cohort begins to age, dependency ratios will again rise, as the working age cohort will be relatively small compared to the old age cohort.

Much attention has been focused in recent years in developing countries on bringing down fertility rates. The successes in controlling both wanted and unwanted fertility has led most countries to the next stage in the transition as fertility nears replacement level in many developing countries. In order to take advantage of the transitional benefits, these countries must position themselves to harness the benefits of a large working age population and lower dependency ratios. This will require policies that allow for smooth functioning of the labor market, for creation of capital to complement the increases in labor through mobilization of increased potential savings, and for the ability to meet increased demands for such services as higher education and health care. As the next phase in the transition will be an aging population and high old age dependency ratios, the development of institutional structures to take care of an aging population also becomes an increasingly important priority for governments.

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